

**ADAPTATION**  
**On-Level Seventh Grade Science**  
**2011-2012**

**Description**

Organisms may be classified based on their unique characteristics. Many of these characteristics are the result of adaptations that occur in order to ensure survival. Adaptations may be divided into three categories, structural, physiological, and behavioral. Organisms depend on their physical features to help them obtain food, keep safe, build homes, withstand weather, attract mates, and reproduce. These physical features are called structural adaptations. Structural adaptation happens over a long period of time in the form of changing genetic traits when the better suited forms of an organism reproduce more successfully in a process called natural selection. The shape of a bird's beak, the number of fingers, the size of a plant's leaves, or the thickness or thinness of a plant's stem, are all structural adaptations that occur as a result of natural selection. In some cases, the inability of organisms to adapt quickly enough have led to their extinction or endangerment. Behavioral adaptations involve the different ways in which an animal reacts to its environment. Nocturnal animals which are active at night, arboreal animals which make their homes in trees, and fossorial, or burrowing animals, are all examples of behavior adaptations. Opening and closing of stomata in plants due to availability of water are also behavioral adaptations. Physiological adaptations permit an organism to perform special functions like regulating temperature or phototropism and other homeostatic functions. Unlike natural selection that requires generations to occur, physiological adaptation is generally narrow in scope and involves response of an organism to a specific stimuli like tanning of skin when exposed to the sun. Changes in the physical environment of an organism can affect its ability to survive and may affect adaptive processes.

**Connections**

Adaptation enables organisms to survive in their environment. Natural selection is a process by which organisms with genetic traits more well-suited for an environment reproduce, while those with traits not well suited may become extinct or endangered. Passing of genetic material from parent to offspring is examined in detail in a previous unit on genetics. The environment also plays a large role in adaptive processes. Interactions of organisms within an ecosystem determine which species will be successful and which will not; these interactions are studied in an upcoming unit on ecology.

**Enduring Understandings**

1. Traits essential for survival may be inherited through genetic material or acquired as a result of environmental factors.
2. Organisms can be classified based on these traits using a dichotomous key.
3. Natural selection is a process by which organisms with traits most well-suited for survival live to reproduce and therefore pass on beneficial traits to their offspring. Organisms with traits detrimental to survival do not survive to reproduce, thereby reducing gene frequency for non-beneficial traits.
4. Structural adaptations are physical characteristics that help ensure an animal's survival, and occur as a result of natural selection over many generations.
5. Behavioral adaptations include an organism's responses to its environment, and may be genetically inherited or acquired as a result of environmental factors.
6. Physiological adaptations generally occur within short time frames as an organism responds to specific environmental factors in an effort to maintain homeostasis.

### **Essential Questions**

1. How are animals classified?
2. What is natural selection and how is it related to adaptation and survival?
3. What are some examples of adaptive traits found in modern plants and animals?
4. What is the difference between structural and behavioral adaptations?
5. How are physiological adaptations related to homeostasis?
6. How can traits be compared?
7. How can changing the physical environment affect the survival of organisms?

### **Essential Concepts and Skills**

By the end of the unit the student is expected to:

1. compare and contrast inherited and acquired traits
2. classify animals using a dichotomous key
3. explain that adaptations occur as responses to stimuli in the environment
4. analyze structural adaptations of different organisms that will enhance their chance for survival
5. explain why behavioral adaptations are necessary and give examples
6. justify why specific physiological adaptations help maintain homeostasis
7. analyze environments to determine which adaptations would be most beneficial
8. predict whether or not an organism will survive abiotic changes in its environment

### **What do students typically have as misconceptions?**

1. Students believe that transmitted characteristics are acquired during the life time of the animal.
2. Acquired characteristics can be inherited.
3. Adaptation is something an organism chooses.
4. Evolution is goal-directed.
5. Evolutionary changes are driven by need.

### **Preconception Survey**

1. What special physical adaptations do birds have?
2. What behavior adaptations do birds have?
3. Why are they important?
4. How did these adaptations occur?

### **Formative Assessment Items**

1. Conduct a simulation where students can model the process of natural selection and changing gene frequency.
2. Create drawings showing adaptations of species in different environments
3. Compose comic strips to illustrate why behavioral adaptations are necessary.
4. Given environmental scenarios reflecting abiotic changes, have students make a decision tree and write a conclusion explaining whether or not those changes would affect the survival of organisms in that environment.

### **TEKS Covered**

**7.11 Organisms and environments.** The student knows that populations and species demonstrate variation and inherit many of their unique traits through gradual processes over many generations. The student is expected to

- A) examine organisms or their structures such as insects or leaves and use dichotomous keys for identification. ***Supporting Standard-Category 4***
- B) explain variation within a population or species by comparing external features, behaviors, or physiology of organisms that enhance their survival such as migration, hibernation, or storage of food in a bulb.
- C) identify some changes in genetic traits that have occurred over several generations through natural selection and selective breeding such as the Galapagos Medium Ground Finch (*Geospiza fortis*) or domestic animals. ***Supporting Standard-Category 4***

**7.12 Organisms and environments.** The student knows that living systems at all levels of organization demonstrate the complementary nature of structure and function. The student is expected to:

- A) investigate and explain how internal structures of organisms have adaptations that allow specific functions such as gills in fish, hollow bones in birds, or xylem in plants.

### **Vocabulary**

natural selection, gene frequency, structural adaptations, behavioral adaptations, physiological adaptations, extinction, endangerment, dichotomous key, inherited traits, acquired traits, biotic factors, abiotic factors, stimuli, homeostasis, evolution, population, species, migration, hibernation, camouflage, mimicry, niche, selective breeding, ancestor